

What is claimed is:

1. A method of packet scheduling for selecting a packet to be output first among packets stored in a plurality of bandwidth guaranteed queues having reserved bandwidths guaranteed therefor and queues of a priority queue class having a plurality of priority queues having priority orders set in advance therefor and subject to preferential control, comprising the steps of  
storing weights given to said bandwidth guaranteed queues and a weight given to overall said priority queue class,  
referring to said stored weights and totaling the weights of said bandwidth guaranteed queues when there are queues in the backlog state and the weight of the priority queue class when there are priority queues in the backlog state to compute the sum,  
computing service times for said queues in the backlog state by using at least said weight, said sum, and the minimum arrival time of the packet having a high priority order and arriving at said priority queue class first as parameters, and  
selecting the single packet having the minimum service time as said packet to be output first by a comparison of magnitudes among said service times.
2. A method as set forth in claim 1, wherein said service times are computed by using a virtual clock in place of a real clock.
3. A method as set forth in claim 1, wherein unselected priority queues are excluded from the computation of said service times according to said priority order.
4. A packet scheduling apparatus for selecting a packet to be output first among packets stored in a plurality of bandwidth guaranteed queues having reserved bandwidths guaranteed therefor and a plurality of priority queues forming a priority queue class having priority orders set in advance therefor and subject to

preferential control, comprising:

a service time computing unit for computing service times based on an input plurality of predetermined parameters for said bandwidth guaranteed queues in the backlog state and a priority queue in the backlog state and having the highest priority order,

a service time comparing unit for comparing the magnitudes of the computed service times with each other and selecting the packet having the minimum service time as said packet to be output first, and

a parameter generating unit for generating said parameters computed so as to achieve both of said bandwidth guarantee and said preferential control.

5. An apparatus as set forth in claim 4, wherein said parameter generating unit has a weight memory means for storing weights given to said bandwidth guaranteed queues and weights given to overall said priority queue class as said predetermined parameters.

6. An apparatus as set forth in claim 5, wherein said parameter generating unit has a priority queue selecting means for selecting a single priority queue based on information concerning said bandwidth guaranteed queues in the backlog state and said priority queues and said priority order.

7. An apparatus as set forth in claim 6, wherein said parameter generating unit has a weight sum computing means receiving as input information concerning the weights of the single priority queue selected by said priority queue selecting means and said bandwidth guaranteed queues in the backlog state and said queues in the related backlog state provided from said weight memory means and totaling the weights of the queues to compute a sum of weights.

8. An apparatus as set forth in claim 7, wherein said parameter generating unit has a minimum arrival time memory means for storing the minimum arrival time of the

packet arriving at said priority queue class first.

9. An apparatus as set forth in claim 8, wherein said parameter generating unit has a service time memory means for storing a computed time in relation to said  
5 service time computed at said service time computing unit in accordance with a service status for every said packet and feeding back the computed time to the service time computing unit for the computation for a next packet.

10. An apparatus as set forth in claim 7, wherein said weight sum computing means

adds said weights of said bandwidth guaranteed queues in the backlog state together and

adds the weight of said priority queue class together if there is any of the plurality of  
15 priority queues in the backlog state so as to compute said sum.

11. An apparatus as set forth in claim 9, wherein the service time memory means

stores a service finish time of the packet  
20 output from the same queue immediately before the service and

stores the service finish time of the packet output last from said priority queue class.

12. An apparatus as set forth in claim 8, wherein  
25 said service time computing unit computes said service time by said minimum arrival time, service finish time, and the weight of said priority queue class for said priority queue selected by said priority queue selecting means.

13. An apparatus as set forth in claim 6, wherein  
30 said service time comparing unit sets a value larger than the maximum value which can be usually taken by the service time as said service time for excluding said priority queues not selected by said priority queue  
35 selecting means from said comparison of the magnitude.

14. An apparatus as set forth in claim 6, wherein said priority queue selecting means comprises

a queue state memory means for storing information of whether or not said packet is stored in each said queue,

5 a preferentially controlled queue memory means for storing information of whether or not each said queue is said priority queue, and

a priority order memory means for storing information concerning said priority order and

10 selects the packet of high priority in the backlog state based on said information and outputs the selected information.

15 15. An apparatus as set forth in claim 5, wherein said weight given to overall said priority queue class is set by a difference between the sum of said weights given to said bandwidth guaranteed queues and a speed of an outgoing link for sending said packet to be output first.

20 16. An apparatus as set forth in claim 8, wherein provision is further made of a virtual clock computing means for computing the virtual clock based on the output from said weight sum computing means, said minimum arrival time memory means stores the virtual clock at the arrival time of the packet arriving at said priority queue class first based on said computed virtual clock, and

25 said service time computing unit computes said service times for said bandwidth guaranteed queues and for said priority queues selected by said priority queue selecting means based on said stored virtual clock.